IMPACT ASSESSMENT OF LONG-TERM CHRONIC RADIATION EXPOSURE ON PLANT POPULATIONS

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One of the major difficulties in the implementation of an ecological risk assessment is a lack of knowledge about the effects from chronic low-level exposures to radioactive contaminants. The acute phytotoxic effects of many environmental factors are well known, but the effects of long-term chronic exposure to low pollutant concentrations is not well understood or adequately included in risk assessment. Although low dose rates may be obtained in the laboratory by protraction, these may not adequately represent true environmental radiation exposures. To understand effects of real-world contaminant exposure properly we must pay attention to what is actually going on in the field. However, for many wildlife groups and endpoints, there are no, or very few, studies that link accumulation, chronic exposure and biological effects in natural settings. The results of long-term field observations in the 30-km Chernobyl NPP zone, in the vicinity of the radioactive wastes storage facility (Leningrad Region), at radium production industry storage cell territory (the Komi Republic), in the Bryansk Region affected by the Chernobyl accident, and in Semipalatinsk Test Site, Kazakhstan that have been carried out on different species of wild and agricultural plants are discussed. Although radionuclides cause primary damage at the molecular level, there are emergent effects at the level of populations, non-predictable solely from the knowledge of elementary mechanisms of the pollutants' influence. Plant populations growing in areas with relatively low levels of pollution are characterized by the increased level of both cytogenetic alterations and genetic diversity. However, the high rate of mutation often had no effect on reproductive ability of plants. Radioactive contamination of the plants environment activates genetic mechanisms, changing a population's resistance to exposure. However, there are ecological situations in which enhanced resistance has not evolved or has not persisted. Consequently, there are good theoretical and practical reasons for more attention being paid to the mechanisms by which populations becomes more radioresistant and to those situations where radio-adaptation appears not to be taking place. Still, effects of chronic radiation for living organisms and populations remain to be a poorly explored and promising field of research. Much more is to be elucidated in our understanding of damage to plant populations from radioactive fall-out.